SAINT KAZTO SECONDARY SCHOOL

2024 MALAWI SCHOOL CERTIFICATE OF EDUCATION SECOND MOCK EXAMINATION

CHEMISTRY

Subject Number: M036/I

Wednesday 27 March 2024 Time Allowed: 2 hours

PAPER 1:00 PM – 3:00 PM

(100 marks)

Instructions:

1. This paper contains 12 pages. Please check.
2. Write your **Name** at the top of each page.
3. This paper contains **two** sections **A** and **B**. In **section A** there are **ten** short answer questions while in **section B** there are **three** restricted essay questions.
4. Answer all the **thirteen** questions in the spaces provided.
5. Use of electronic calculators is allowed.
6. The maximum number of marks for each answer is indicated against each question.
7. In the table provided on this page, **tick** against the question number you have answered.

Question number	Tick if answered	Do not write in these columns	
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
TOTAL MARKS			

Section A (70 marks)

1.

a. Define an acid in terms the Lowly- Bronsted theory

_____(1 mark)

Use the equation to answer question 1(b) that follow

$$HCl + H_2O \rightarrow Cl^- + H_3O^+$$

b. Identify the conjugate acid-base pairs from the above given equation.

_____(2marks)

c. Magnesium react with zinc sulphate according to the equation :

$$Mg(s) + Zn(s) \rightarrow MgSO_4(aq) + Zn(s)$$

i. Write the half reduction equation

_____ (2 marks)

Ii. Identify the oxidizing agent

_____(1mark)

2 . a. Define the mole

_____

_____(1 mark)

b. Sodium (Na) reacts with water (H_2O) to produce sodium hydroxide (NaOH) and hydrogen gas (H_2) according to the following equation:

$$Na(s) + H_2O(l) \rightarrow NaOH(aq) + H_2(g)$$

i. Balance the equation (3 marks)

ii. If 46g of sodium metal reacts with 18g water, what mass of sodium hydroxide is produced?

(1 Marks)

iii. . What volume of hydrogen gas is produced in the reaction (II) above assuming the reaction takes place at room temperature and pressure?

(2 marks)

3. a. Calculate the empirical formula of an organic liquid containing 26.7% carbon, 2.22% hydrogen with the rest being oxygen.

(4 marks)

b. The molecular mass of the liquid is 90. What is the molecular formula?

(2 marks)

4. Table below shows bond energies of some elements. Use it to answer the questions that follow

Bond	Energy(Kj/mol)
C—H	413

O=O	498
O—H	464
C=O	805

Methane reacts with oxygen to produce carbon dioxide and water according to the following equation:

$$CH_{4(g)} + O_{2(g)} \rightarrow CO_{2(g)} + H_2O(l)$$

a. Use the bond energies to calculate bond breaking and bond making energy

(5 marks)

b. Is the reaction exothermic or endothermic?

_____ (1 mark)

c. Draw the energy level diagram for the reaction above

(3 Marks)

5. a. Define allotropy

_____

_____(1 mark)

b. Explain briefly why graphite is used as a lubricant but not diamond though both are allotropes of carbon

_____

_____(2 marks)

c. Give any one alloy and its use

_____

_____(2 marks)

6. a.State one advantage of hard water

_____

_____ (1 mark)

b. Describe how boiling method removes water hardness

_____

_____

_____

_____(3 marks)

8. a. State one advantage of each of the following ways of waste treatment:

9.

i. Incinerators

_____

_____

(1 mark) ii. Recycling

_____

_____

(1 mark)

b. Explain any two major sources of waste and one example of the waste for each source.

_____

_____

_____

_____

(4 marks)

10. a. Below is the equation that shows the formation of an organic compound. Use it to answer the questions that follow.

$CH_2 = CH_2 (g) + H_2O(l)$ $\xrightleftharpoons{H2SO4}$ _____ H= -45Kj/mol

i. Complete the equation above (1 mark)

ii.Name the process above _____

(1 mark

b. Draw the structural formula of the compound 2,2-dimethylpentane

(1 mark)

c. Figure below is the diagram of part of the electrochemical series. Use it to answer questions that follow.

Reaction	E^{θ}, volts
$Fe^{2+}(aq) + 2e^{-} \rightleftharpoons Fe(s)$	-0.44V
$Cu^{2+}(aq) + 2e^{-} \rightleftharpoons Cu(s)$	+0.34v

i.Calculate the standard e.m.f of the following electrochemical cell

$$Fe(s)|\ Fe^{2+}(aq)||\ Cu^{2+}_{(aq)}\ |Cu(s)$$

(2marks)

ii.Will the reaction in (b) above going to take place or not? Give a reason for your answer.

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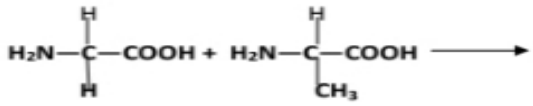
_____

9. **a.** Glycine and alamine are amino acids that undergo polymerization process to form a protein. Write down the **two** products formed when glycine and alamine monomers are polymerized.



(2 marks)

_____

_____

b . Draw and name all isomers of butanal

(4 marks)

10 . a. Mention two allotropes of phosphorus

_____

_____

(2 marks)

b.Briefly explain how sulphuric acid is manufactured through the contact process

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(7 marks)

c . Give any one use of sulphuric acid

_____

_____ (1 mark)

Section B (30 marks)

11. a. Describe ozone layer depletion. In your description include the equations involved.

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_____(5 marks)

b. Describe how an insoluble salt of Barium sulphate ($BaSO_4$) can be prepared from Barium chloride ($BaCl_2$) and sodium sulphate (Na_2SO_4) by precipitation method.

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_____(5 marks)

12. a. Briefly describe how nitrogen is extracted from air

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_____ (4 marks)

b. Describe how sacrificial protection prevents rusting

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(3 marks)

C. describe the formation of a polar covalent molecule.

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_____(3 marks)

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13. With the aid of a well labeled diagram, explain how the electrolysis of dilute sodium chloride solution occurs. (hint: the explanation should include type of reaction and discharge on each electrode and the half equations).

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_____ (10 marks)

END OF THE QUESTION PAPER